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ABSTRACT: This paper relates the postdisplacement experience of individuals to changes in the competitive position of the industry, *vis a vis* the rest of the world, from which the individual was displaced. The focus is on the duration of unemployment spells and the change in wages accompanying displacement. Controlling for demographic characteristics, we find that workers from declining traded industries suffer greater hardship after displacement than do workers from nontraded or expanding traded industries. They incur both a longer spell of unemployment and a greater loss of earnings. Furthermore, workers separated from expanding traded industries fare better than those from other industries.

This evidence regarding the duration of the unemployment spell is then combined with previous results regarding the volume of trade related displacements to provide an accounting of the change in the aggregate number of weeks of unemployment resulting from changing trade patterns. Although the expansion of some traded industries was sufficient to offset the displacement effects of contracting traded industries, the longer spell of unemployment incurred by those displaced from contracting industries is found to result in a significant increase in unemployed resources.

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I. Introduction

The decade of the 1980s was fraught with charges that international trade was stealing jobs from the U.S. economy. Indeed, the AFL–CIO asserts that:

> "Millions of well–paying and high–quality job opportunities in the middle tier of the nation's income structure have been sacrificed as a result of America's trade decline."[1]

Haveman (1992) provides an extensive analysis of the change in the volume of displaced workers arising from changes in trade patterns. While displacements are not synonymous with jobs or employment, they do provide a reasonable indicator of the forces exerted by trade on jobs and employment. The analysis presented there finds that the adjustment to changes in comparative advantage that took place during the 1980s served to *reduce* the overall number of individuals displaced over the course of the decade. This result suggests that perhaps employment in the United States was not affected to the extent that rhetoric would have us believe.

Despite this evidence, few would suggest that the pattern of employment in the United States has not been altered by changes in the global trading system. As is clear from Appendix A, jobs were lost in the early 1980s while jobs were created in the latter part of the 1980s.[2] Although the analysis suggests insignificant changes in overall employment, the distribution of employment, both across industries and time, has clearly been altered by changing trade patterns.

[1] The Pocketbook Issues: *AFL-CIO Policy Recommendations for 1992*, pg. 16.

[2] This is consistent with the findings of Singleton (1990).

This finding is consistent with the mainstream of economics which holds that international trade, while having an important influence on the long run efficient allocation of resources, has little effect on aggregate unemployment.[3] This view of the long run, however, does not take into account the short run transitory dislocations that result from changing trade patterns. That is, the reallocation of resources brought about by trade can affect aggregate unemployment by influencing, in the short run, the number of unemployed workers and duration of observed joblessness. The impact on the volume of unemployed workers is clear from the results mentioned above; it was larger in the beginning of the 1980s and smaller in the late 1980s, while having little if any net effect on the number of unemployed workers over the course of the decade. The impact of changing trade patterns on the duration of observed joblessness, however, remains a mystery.

Accordingly, this paper attempts to determine whether the cost of jobs lost in some industries is greater than the benefits associated with job gains elsewhere. These costs and benefits are measured in terms of weeks of unemployment and changes in wages for displaced individuals. The analysis builds on the assumption that an industry or time period that benefits from changing trade patterns experiences fewer displacements and, conversely, that declining industries and time periods experience increased displacements. The question is, if changing trade patterns result in no, or almost no, change in the number of displacements, but instead result in a transfer of displacements from one industry to another, what implications does this have for the aggregate number of weeks of unemployment? *I.e.,* does this particular reshuffling of displacements from expanding to declining traded industries result in significantly longer or shorter observed spells of unemployment? Does it result in larger or smaller changes in observed wages?

There is reason to believe that, *ceteris paribus* trade displaced workers will suffer greater postdisplacement hardship than will other displaced workers. As is discussed in Section 2, displacement results in a depreciation of specific forms of human capital. Trade

[3] A view most recently expressed by Krugman (1993) and Mussa (1993).

as a source of displacement is likely to result in a more substantial depreciation than are other reasons for displacement. The intuition underlying this claim stems from the concurrent influence of trade on industries that place the highest value on the displaced worker's human capital. That is, industries that would be the most likely to hire a trade displaced worker are also likely to be suffering from the effects of international trade.

Previous studies have found evidence that workers displaced by trade do tend to exhibit greater difficulty than other displaced workers.[4] This result is, however, generally based on the finding that trade displaced workers possess characteristics that increase the difficulty of obtaining subsequent employment. Few of these studies, however, utilize individual level data; exceptions include Kruse (1988) and Richardson (1984). Kruse, using the 1984 Displaced Worker Survey and a somewhat tenuous connection between observed displacements and international competition, finds that trade, controlling for various demographic characteristics, as a reason for displacement is responsible for a statistically insignificant 0.4 week increase in the median duration of joblessness. Richardson, using data from a 1979 survey of Trade Adjustment Assistance (TAA) recipients, also finds substantial differences in the postdisplacement experiences between trade displaced and other displaced workers. He cannot, however, conclude that this difference is solely the result of demographic characteristics; rather, the differences in job and income recovery are primarily due to unidentified variables. But as pointed out in Tyson *et al.*, there are reasons to be wary of results based on the TAA data; reasons relating to the sample of workers applying for TAA benefits. That is, many workers may not identify trade as the source of their displacement, and many workers and employers are unaware of the existence of the TAA and hence do not apply for benefits.

This study adds to the literature by providing results based on a stronger connection between international competition and displacement and is free of the problems inherent in the TAA dataset. The connection to international trade is based on a careful

[4] See Tyson *et al.* (1988, Ch. 2) for a survey of these studies.

econometric analysis of the influence of trade flows on displacements by industry in the year the observed displacement took place. The primary source of data for this study is the time series of Displaced Worker Surveys (DWS) from 1984 through 1992. In conjunction with the results found in Haveman (1992) it is possible to identify individuals who are likely to have been displaced by changes in the pattern of international trade. The sample of observations on displaced workers is divided into three subsamples: those from declining traded industries, those from expanding traded industries, and those from nontraded industries.[5,6]

Given the preponderance of studies pointing to demographic characteristics, rather than something inherent in trade displacement, for the weaker job recovery of trade displaced workers, this study decomposes the differences in postdisplacement joblessness into two sources. The first source is the extent to which workers displaced from different industries are characterized by observable traits, such as lower levels of education, that would lead to longer spells of unemployment. The second source is the extent to which the type of industry, controlling for observable individual–specific characteristics, affects the postdisplacement experience. The extent to which workers with identical demographic characteristics face a greater struggle when displaced from declining traded industries will be taken as evidence of a greater need for assistance to trade displaced workers. The presence of such differences is put forth as justification for a program, such as the Trade Adjustment Assistance (TAA) program, which provides additional unemployment benefits to workers whose displacement is determined to be trade–related.[7]

In what follows, the postdisplacement labor market experience is represented by the observed change in wages and the duration of the spell of unemployment. Section 2 contains a theoretical discussion of the expected relationship between the industry of

[5] It should be noted that what is categorized here as a "declining" traded industry need not be an industry in decline. The label "declining" is used as a reflection of increased international competition, not of absolute expansion or contraction. The same holds for "expanding" traded industries.

[6] The "traded" industries are listed in Table A.1. Nontraded industries make up the rest of the economy.

[7] Additional reasons for trade related assistance may be to facilitate the acceptance of reduced protection for a particular industry. See Richardson (1984) for a more thorough discussion.

displacement and the degree of postdisplacement difficulty. Section 3 provides a brief description of the data used and descriptive statistics. Section 4 discusses the econometric methodology and the sample of observations used in the analysis presented in Section 5, while Section 6 contains some general conclusions and a discussion of policy implications.

II. Theory and Expectations

The *a priori* expectations are that individuals displaced from declining traded industries will have a more difficult postdisplacement labor market experience than those displaced from other industries. In addition, it is expected that those displaced from expanding traded industries would fare better than all others. In particular, trade displaced workers are expected, *ceteris paribus* to experience longer spells of unemployment and a larger decline in wages than other displaced workers. This section provides a foundation for these expectations.

Extended employment in a particular industry will generally endow an individual with human capital biased towards industry/occupation–specific skills. An individual experiencing permanent displacement from that industry or occupation suffers an immediate erosion of the industry/occupation–specific portion of their human capital, leading to a decline in future wages. It is hypothesized that a certain amount of substitutability exists in industry–specific human capital; that is, industry-specific human capital acquired in industry A will substitute (albeit imperfectly) for industry-specific human capital in industry B. This substitutability will serve to reduce the erosion of human capital resulting from displacement. For example, an individual displaced from the auto industry may, because of skills developed there, be more suited to working in some other manufacturing industry than will an observationally equivalent worker displaced from a service oriented industry.

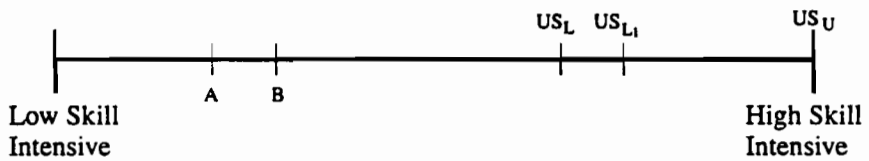
The erosion of human capital will therefore be minimized when there is demand for skills similar to the displaced worker's specific form of human capital. It is this observation that leads one to believe that a trade displaced worker will experience a longer

spell of unemployment and a larger reduction in wages than will other individuals. The driving force behind this assertion is a concept as fundamental as the chain of comparative advantage.[8]

The connection with the chain of comparative advantage is as follows. For simplicity, assume there is a continuum of goods and that there are only two inputs to production, skilled and unskilled labor. Further assume that the goods can be ranked according to the skill intensity of the production process and that skill intensity is a reasonable proxy for industry-specific types of human capital. Figure 1 is a representation of such a rank-ordering where the production of good A uses unskilled workers relatively more intensively than an industry such as B. The human capital substitutability hypothesis implies that individuals displaced from industry A will minimize the erosion of their human capital should they become re-employed in some industry in the range $[A - \epsilon, A + \epsilon]$; *i.e.*, in an industry "close to" A in the chain of comparative advantage. If we assume that the United States is among the countries endowed with a highly skilled labor force, comparative advantage suggests that the United States would produce those goods in the segment $[US_L, US_U]$, the goods with the most skill intensive method of production.

Figure 1

Continuum of Goods Organized by Skill Intensity of the Production Process



A change in the skill composition of the labor force outside of the United States could imply a narrowing of the scope of U.S. production.[9] The United States might now

[8] See Deardorff (1979).

[9] Note that such a change in production patterns could also result from the international flow of technology, reduced transport costs, or a change in the skill composition of workers in the United States.

produce only goods in the range $[US_{L_1}, US_U]$. The above change in endowments implies that industries in the range $[US_{L_1}, US_U]$ will expand, while industries in the range $[US_L, US_{L_1}]$ will contract. The differential effects for workers displaced from contracting industries, relative to those displaced from expanding industries,[10] arise from the fact that industries "close to" a declining industry are also likely to be declining, while industries "close to" expanding industries are also likely to be expanding. Hence, the re-employment and wage possibilities for workers displaced from declining traded industries are less promising than for those displaced from expanding traded industries.

In addition to the industries discussed above, the empirical analysis takes into account workers displaced from nontraded industries. There is no *a priori* reasoning that suggests nontraded industries will expand or contract with changes in the space U.S. manufacturing takes on the traded goods continuum. It is therefore conjectured that the postdisplacement experience of those from nontraded industries will be of intermediate severity.

III. Descriptive Statistics

III.1 Data Sources

The data used in this study are from the five Displaced Workers Surveys (DWS) conducted between 1984 and 1992.[11] These surveys are designed to provide data pertaining to the effects of involuntary job loss, asking respondents aged greater than 19 if they lost a job within the last five years to which they have not returned. The surveys include information regarding the previous job, wages, full or part time status, and the reason for displacement: plant closing, slack work, the abolition of a position, failure of a self-owned business, the end of a seasonal job, or "other reasons."[12]

[10] Displacements can occur in expanding industries via the exit of inefficient firms and through the imperfect process of replacing voluntary attritions.

[11] These surveys were conducted as a supplement to the January Current Population Survey (CPS) of the same year.

[12] See U.S. Department of Labor (1985 and 1987) for more information regarding the Displaced Worker Surveys.

For this study, only workers displaced from full time positions that were at least 18 years old at the time of the survey and are currently less than 65 years old are included. The sample is further confined to those displaced because of a plant shutdown, slack work, or the abolition of a position.[13] Not only does this restriction reduce problems of data contamination,[14] but this sample most closely reflects the group of displaced workers influenced by changes in trade patterns. An individual must also be an active labor market participant in order to be included.[15]

The subset of the DWS used for the analysis of unemployment duration includes all workers over the age of 17 at the time of displacement and currently less than 65 years of age. The lower bound is imposed as it is assumed that individuals in the labor market aged 18 and above are more reflective of permanent lifetime participants in the labor market, while the upper bound merely omits those expected to be retired. The sample is further restricted to include only those displaced from full time positions and those that reported weekly earnings in excess of $80/week.

The sample of observations used to analyze the observed changes in wages is a subset of that used for the analysis of unemployment duration. The subset is chosen based on the current employment status of the individual. If the individual is not currently employed, full time, then she is not included in the analysis. Note that this excludes not only individuals that have not worked since displacement, but also individuals that have worked since displacement but have for one reason or another left that job as well. The sample further excludes those observations that do not contain reasonable current wages.[16]

The five Displaced Workers Surveys provide a sample covering the years 1979 through 1991. The observations used in the estimation, however, are restricted to the years

[13] This excludes workers displaced because of the end of a seasonal job, the failure of a self–owned business, or "other reasons."

[14] *I.e.*, contamination through the inclusion of workers that returned to their previous employer and hence were not truly displaced.

[15] This excludes individuals reporting employment status as: keeping house, going to school, unable to work, retired or other. These individuals are excluded because it is believed that they might exhibit artificially long unemployment spells.

[16] Reasonable is defined by approximately $2/hour. This means a minimum wage of $40/week for part time workers and $80/week for full time workers in constant 1985 dollars.

1981 through 1989. This restriction comes about for two reasons. First, estimation of the volume of displacements due to trade was not possible for years prior to 1981. Second, only workers displaced more than two years prior to the survey were included. This second restriction is an effort to reduce problems of censoring in the sample. This restriction eliminates individuals that are recognizably in the midst of the spell of joblessness at the time of the survey. Given the dramatically longer spell of unemployment observed for trade displaced workers (discussed below), including these observations would likely bias the results.

Aggregates of the data used to classify individuals as displaced from expanding or declining traded industries are presented in Appendix A. These data, derived in Haveman (1992) indicate whether there was an increase or decrease in displacements for each traded industry in each year due to changes in international competition. For each observation in the DWS, the individual specifies an industry from which and a year in which they were displaced. If the year/industry combination was found to exhibit a larger number of displacements than it would have in the absence of changing trade patterns, that individual is classified as displaced from a declining traded industry. Conversely, if displacements were lower, the individual is classified as displaced from an expanding traded industry. The remaining observations are classified as being displaced from a nontraded industry.

The results presented in Haveman stem from a general equilibrium analysis of the influence of changes in import and export prices on the volume of displacements from 29 disaggregated industries. Changes in the import or export price of goods in the industry relative to the aggregate price level are interpreted as changes in the degree of international competition faced by the industry. A decline in the import or export price in an industry relative to an economy-wide price index is interpreted as an increase in international competition faced by U.S. firms in that industry. The methodology first estimates the responsiveness of industry displacements to changes in competitiveness and then proceeds to use counterfactual analysis to estimate the change in the volume of industry displacements

resulting from changes in trade patterns.

III.2 Sample Statistics

This section provides a brief description of the displaced workers and how they differ across the three categories of industries. Table 1 contains descriptive statistics for all individuals displaced from full time jobs in the 1980s. Column 1 contains statistics for the entire sample, while Columns 2, 3, and 4 describe those displaced from declining traded, nontraded, and expanding traded industries, respectively. For the sample, the mean duration of unemployment was 20 weeks; 68% of the individuals were re-employed at the time of the survey and 14% had dropped out of the labor force. The average predisplacement weekly wage of those displaced was $378 (in constant 1985 dollars), and the postdisplacement wage, for those who were re-employed, decreased by an average of 10%, in real terms, between the date of displacement and the survey.[17]

Table 1 shows some striking differences across the different categories of displaced workers. First, although workers displaced from traded industries (Columns 2 and 4) are less likely than those from nontraded to be re-employed at the survey date, and workers that are re-employed are more likely to be employed full time. In addition, they are less likely to be female or well educated, and are slightly older; 14% of traded workers are over the age of 50, as opposed to just over 10% for nontraded. Of the workers who were re-employed, workers separated from traded industries suffer a significant real reduction in wages, with the greatest loss going to those displaced from declining traded industries. Those from declining traded industries also suffer spells of unemployment that are almost 10 weeks longer than all other workers, 28 weeks versus 18 weeks. This is consistent with a lower probability of being re-employed at the survey date.

These data suggest that the postdisplacement experiences of trade displaced workers do, in fact, differ significantly from other workers. Consistent with the human capital

[17] These statistics are comparable to those found elsewhere (*e.g.*, Kruse (1988)), but may differ from others because of the scope of the sample, *e.g.*, Podgursky (1991), which includes workers displaced from part time jobs.

Table 1

Descriptive Statistics: All Displaced Workers in the 1980s

Variable	All	Declining Traded	Nontraded	Expanding Traded
Demographics				
Age	36.99	37.91^{NE}	36.36	38.62
Age > 50	11.62%	13.63^{NE}	10.24	15.26
Married	65.44%	69.31^{N}	63.54	69.16
Black	15.27%	15.30	14.92	16.74
Female	35.63%	33.98^{N}	36.58	33.41
12 or more years of school	83.40%	78.11^{NE}	85.66	79.77
Old Job				
Tenure	4.84	6.25^{NE}	4.04	6.68
Wages	377.89	376.98	378.58	376.01
Wage Differential	3.60%	12.10^{NE}	-0.38	10.96
New Job				
Part Time	10.30%	9.07^{N}	11.04	8.53
New Wages	353.94	347.48^{N}	356.41	350.43
Wage Differential	1.28%	3.60^{N}	0.07	3.83
Δ(Wage)	-10.22%	-16.47^{NE}	-8.20	-11.81
Displacement				
Weeks Unemployed	19.75	27.65^{NE}	17.86	18.43
Censored	24.60%	28.20^{NE}	23.37	25.77
Reason Displaced:				
Shutdown	47.72%	47.86	47.51	48.47
Slack Work	38.27%	42.13^{N}	36.70	40.56
Position Abolished	14.02%	10.02^{N}	15.79	10.97
Industry of Disp:				
Declining Traded	17.84%	–	–	–
Expanding Traded	15.48%	–	–	–
Employment				
Re-employed	68.11%	65.07^{N}	69.56	65.37
Unemployed	17.64%	19.49^{N}	16.77	19.24
Not in Labor Force	14.25%	15.43^{N}	13.67	15.39
N	24,034	4,432	15,756	3,846
Weighted N (millions)	40.6	7.4	26.3	6.8

Source: Calculations by the author from the 1984, 1986, 1988, 1990 and 1992 Displaced Worker Surveys.

^{N} Represents means for declining traded and nontraded industry workers that are statistically significantly different at the 95% level.

^{E} Represents means for declining traded and expanding traded industry workers that are statistically significantly different at the 95% level.

story of Section 2, workers from declining traded industries suffer more than those from either nontraded or expanding traded industries. The implication of the theory was that those displaced from expanding traded industries should suffer the least hinges on the relative growth rates of the industries involved. If the nontraded industries were growing at a faster rate than the expanding traded industries,[18] this could explain the longer spell of joblessness and the larger decline in wages for those from expanding traded industries relative to nontraded industries. These data do not, however, rule out the possibility that this is simply due to observable characteristics and has nothing to do with the particular source of displacement.

IV. Econometric Methodology

The econometric analysis focuses on the differences in the postdisplacement experience of workers separated from expanding traded industries, declining traded industries, and nontraded industries. This section contains a detailed presentation of the methodology used to measure the effects of trade displacement on unemployment duration and postdisplacement wages.

The analysis makes use of two dummy variables: TRDDEC and TRDEXP, where

$$\text{TRDDEC} = \begin{cases} 1, & \text{if displaced from a } \textit{declining} \text{ traded industry,} \\ 0, & \text{otherwise,} \end{cases}$$

and

$$\text{TRDEXP} = \begin{cases} 1, & \text{if displaced from an } \textit{expanding} \text{ traded industry,} \\ 0, & \text{otherwise.} \end{cases}$$

Recall the definition of a declining (expanding) industry: a traded industry is labeled as declining (expanding) if changing international competition increased (decreased) observed displacements from said industry. The remainder of this section discusses the use of these variables in determining the effect of the type of industry of displacement on postdisplacement labor market experiences.

[18] Evidence from Carey and Franklin (1991) suggests this to be the case.

IV.1 Duration of Unemployment

The equation used to analyze unemployment duration takes the form:

$$U_i = g\{x_i\beta + h(Trade)\}, \tag{1}$$

where U is the duration of unemployment, which depends on the linear function in brackets; x_i is a vector of individual–specific control variables, and $h(\cdot)$ is a function of trade competition. In the analysis, $h(\cdot)$ will take one of two forms; either

$$h(\cdot) = \gamma_1 TRDDEC + \gamma_2 TRDEXP \tag{2}$$

or

$$\begin{aligned} h(\cdot) =& \gamma_1 TRDDEC \cdot TENURE + \gamma_2 TRDEXP \cdot TENURE + \\ & \gamma_3(1 - TRDDEC - TRDEXP) \cdot TENURE, \end{aligned} \tag{3}$$

where $TENURE$ is the number of years the individual was employed in the particular industry prior to displacement. In each case, it is expected that γ_1 will be significantly greater than γ_2. In (2), this indicates that there is some unobservable aspect of displacement from a declining industry that is associated with longer spells of unemployment, while specification (3) provides evidence of greater hardship stemming from the depletion of industry-specific human capital. If longer tenure on the job is a measure of the investment in industry-specific human capital, we would expect trade displaced workers to suffer a more substantial erosion of their human capital and hence have more limited employment possibilities. In specification (2), γ_1 is expected to be positive and γ_2 is expected to be negative, while in specification (3), γ_1, γ_2 and γ_3 are all expected to be positive; previous research has shown that increasing tenure is associated with longer spells of unemployment. γ_1 is expected to be greater than both γ_2 and γ_3, while the relative magnitudes of γ_2 and γ_3 are determined by the interplay of relative industry growth rates and industry-specific human capital effects.

In the absence of censoring, equation (1) could be estimated using ordinary least squares techniques. The unemployment data contained in the DWS are, however, subject to censoring from two sources. First, some individuals are in the middle of their jobless spell at the time of the survey, and second, the unemployment duration variable is topcoded at 99 weeks. This means that the actual period of joblessness, should it be incomplete or exceed 99 weeks, is unobservable. The presence of censoring requires the use of duration analysis.

The relationship between the explanatory variables and the duration of unemployment is examined in the context of an *accelerated failure–time* model.[19] More specifically, a Weibull model of duration dependence is employed.[20] The Weibull model is a single parameter proportional hazard model, with a hazard function, or conditional exit rate, of the following form:[21]

$$\theta(x,t) = \Pr(U = t|U > t-1) = \lambda\alpha t^{\alpha-1},$$

where t is the current week, $\lambda = e^{-x\beta}$, and α and β are the parameters to be estimated. In this framework, α measures the degree of time dependence of the hazard rate. If $\alpha = 1$, the hazard rate is time invariant; $\alpha > 1$ implies a monotonically increasing hazard rate while $\alpha < 1$ implies a decreasing hazard rate. A decreasing (increasing) hazard rate means that the probability of escaping unemployment in the next period declines (increases) over time. A value of α less than one could be the result of either true duration dependence, or unobserved heterogeneity in the worker.[22,23]

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19 Lancaster (1990), pg. 40.

20 Other specifications such as the exponential and gamma distributions were estimated with no significant difference in the results.

21 Lancaster (1990), pg. 44.

22 See Lancaster (1979).

23 One consequence of this choice of model is the proportional hazard restriction. This restriction imposes the constraint that the hazard rates of two observations with different regressor vectors x_1 and x_2 be in the same proportion $\theta(x_1)/\theta(x_2)$, for all t. The implication is that the importance of a particular characteristic in determining the duration of unemployment is not permitted to change with time. This might be inappropriate for several of the explanatory variables; for instance, high tenure on the previous job may reflect a lack of knowledge of labor markets. This would imply inefficient search during the first part of the unemployment spell that was not present for somebody with more recent job search experience. The effect of an initial inefficient search would be a lower hazard or exit rate in the first few weeks of joblessness for individuals with long

Econometric Technique

As discussed above, what is observed is not U, the actual duration of joblessness, but U^*, where

$$U^* = \begin{cases} U, & \text{if the individual is employed} \\ P+1, & \text{if } U \geq P, \end{cases}$$

where P is the potential observable unemployment duration. This truncation arises from two distinct sources, the topcoding of the unemployment duration variable at 99 weeks and incomplete spells of unemployment of those displaced close to the survey date. The latter problem is dealt with by omitting individuals displaced within two years of the survey date. The former complication, the topcoding of weeks of unemployment, is accounted for by employing the following maximum likelihood estimation technique for the Weibull distribution. This technique is conceptually analogous to that for Tobit analysis of normal distributions with truncated observations.

If U is observed for an individual, her contribution to the likelihood function is simply the probability density function of completed duration,

$$f(U) = \alpha U^{\alpha-1} exp\{-X\beta - U^{\alpha} exp(-X\beta)\}.$$

If $P < U$, then her contribution is $f(U_i^*)$:

$$\begin{aligned} \text{Prob}(U_i^* \geq P_i + 1) &= \int_{P_i+1}^{\infty} f(y)dy \\ &= exp\{-U_i^{*\alpha} exp(-X_i\beta)\} \end{aligned}$$

The likelihood function for the entire population is then

$$L = \prod^{n_1} \alpha U_i^{*\alpha-1} exp\{-X_i\beta - U_i^{*\alpha} exp(-X_i\beta)\}$$

$$\text{x} \prod^{n_2} exp\{-U_i^{*\alpha} exp(-X_i\beta)\},$$

predisplacement tenure. Presumably, with the passage of time, the search would become more efficient and the importance of tenure in determining the exit rate would diminish. The potential for this problem also exists with respect to the predisplacement wage. An individual displaced from a high wage industry might set an initial reservation wage inappropriately high. Again, with the passage of time, this reservation wage would presumably be adjusted to a more appropriate level.

where n_1 denotes the sample of non-censored observations, and n_2 denotes the topcoded observations.[24] The estimated parameters measure the proportional change in the expected duration of joblessness resulting from a unit increase in the corresponding explanatory variable, *i.e.*,

$$\frac{\partial \ln E(U)}{\partial x_j} = \frac{\beta_j}{\alpha}.$$

The choice of control variables is guided by the theoretical search literature. In addition, TENURE, the time spent at the predisplacement job, is included to reflect the amount of industry–specific human capital the individual has developed. It is also possible that TENURE reflects the expectations of recall by the individual, since, *ceteris paribus* an individual with more experience in a given industry will be a more desirable worker. The expected sign on TENURE is therefore positive; as the expectation of recall rises, search effort declines, and hence the duration of unemployment also rises, or equivalently, the escape rate from unemployment falls. A crossproduct term between tenure and the traded variables is also included. As tenure is a reflection of the amount of traded-industry-specific human capital, these crossproduct terms will capture differences in the depreciation of human capital associated with displacement from the different types of industries.

It is often argued that import competition is most likely to occur in industries that pay relatively high wages. If wages are high, this could be an indication of excess rents in the industry. Imports are attracted by these rents, resulting in displacements. In an effort to obtain a position which also pays such rents, the individual may set their reservation wage inappropriately high, thereby increasing the duration of unemployment. To control for this explanation, each specification includes a 3–digit interindustry wage differential calculated from a time series of March Current Population Surveys. The interindustry wage differential is the premium workers receive for being employed in a particular industry.

[24] Solon (1985) employs this methodology to assess the impact of the receipt of unemployment insurance on unemployment duration. Other studies that utilize the DWS to estimate jobless duration models are Kruse (1988) and Podgursky and Swaim (1987a and 1987b).

That is, the percentage difference between the wages received in an industry and the average wage of all workers with similar observable characteristics.

The state unemployment rate for experienced workers in the year of displacement as well as the trend in state unemployment are included as a measure of the economic conditions surrounding the search for employment.[25] The actual unemployment rate should enter negatively, reflecting a larger pool of applicants for each job opening. The trend should also enter with a negative coefficient; a positive trend indicates a deteriorating economic climate in which to conduct a job search.

IV.2 Changes in Wages

The second point of analysis concerns the postdisplacement wages.[26] To determine the differential effects of the industry of displacement on earnings, the focus is on the following model of the change in earnings experienced by displaced workers:

$$\ln W_{i,t} - \ln W_{i,t-1} = h(x_i\beta) + \epsilon_j. \tag{4}$$

$W_{i,t}$ is the individual's current weekly earnings, $W_{i,t-1}$ is the weekly predisplacement wage, and x_i is a vector of individual-specific characteristics, to be discussed below. The predisplacement wage, $W_{i,t-1}$, is inflated to match the year of the current earnings. The inflator is calculated for 2-digit census industries from annual March CPS computer tapes and is defined simply as the annual rate of aggregate wage growth of each industry. It is thus assumed that the individual's wages would have grown at the same rate as that of the average worker in the industry. The difference in wages is then the current wage less the expectation of wages in the undisplaced state.[27]

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[25] The trend state unemployment rate is defined simply as the change in state unemployment rate in the year following displacement.

[26] The methodology outlined here was inspired by Addison and Portugal (1989).

[27] There are problems with this approach associated with the fact that we cannot pin down the time of displacement within the year reported. This and other problems are discussed in Valletta (1991). Even considering these problems, this method provides results that are more informative than would the alternatives.

Although the equation of primary interest is the change in wages, it should be recognized that this is a particular restriction of a more general model which explains the postdisplacement wages:

$$\ln W_{i,t} = x_i\beta + \gamma \ln W_{i,t-1} + u_{i,t} \tag{5}$$

where $u_{i,t}$ can be decomposed into two parts:

$$u_{i,t} = A_i + \eta_{i,t}.$$

A_i is an unobserved individual-specific heterogeneity component, and $\eta_{i,t}$ is a serially uncorrelated normally distributed error component.

The equation in (4) is a first differenced version of equation (5):

$$\ln W_{i,t} - \ln W_{i,t-1} = (x_{i,t} - x_{i,t-1})\beta + \gamma(\ln W_{i,t-1} - \ln W_{i,t-2}) + v_{i,t}, \tag{6}$$

where

$$v_{i,t} = \eta_{i,t} - \eta_{i,t-1}$$

is distributed normally. Due to data limitations, the restriction that $\gamma = 0$ is imposed during estimation. This imposes the restriction that only the current displacement matters for the change in wages. That is, any prior history of displacement, should it exist, is unimportant for the change in wages experienced because of the current displacement event. A prior displacement event will be important to the extent that it influences $W_{i,t-1}$. Given that this influence will dissipate with time, the extent to which this restriction is appropriate depends on the time between involuntary displacements. A lower bound on the time since the previous displacement is simply the tenure on the predisplacement job; the undifferenced tenure variables are therefore included in the differenced regressor matrix. The coefficient on the tenure variable will also include the effects of other elements related to involuntary displacement, such as inefficient initial job search. It will, consequently, be impossible to attach concrete meaning to the coefficient on the tenure variable. Differences associated with the industry of displacement will, however, be unaffected by this problem.

The method of estimation takes into account two sources of bias inherent in simple OLS estimation of the βs in equation (4). The first source of bias is the selection criterion employed in determining the sample. The sample includes only those employed, full time, at the survey date. If there is any systematic difference between those employed and those remaining unemployed, the estimated coefficients will be biased and inconsistent. The conventional two–step selectivity adjustment procedure suggested by Heckman (1979) is therefore implemented.

The second source of bias arises from the endogeneity of the duration of unemployment in the postdisplacement wage equation. Both unemployment duration and postdisplacement wages are determined by the distribution of wage offers received. To the extent that this distribution is not perfectly explained by the included regressor matrix, the duration of unemployment will be correlated with the error term. The correction employed involves calculating the predicted spell of unemployment from the analysis of the previous section. The predicted duration variable is then used as a regressor in the postdisplacement equation (Lee 1981). This approach conforms to the instrumental variables technique and appropriately corrects for the endogeneity of the duration of joblessness.

V. Results

Referring back to Table 1, recall that individuals displaced from declining traded industries tend to experience longer spells of unemployment and a more substantial decline in wages than do workers from nontraded or expanding traded industries. Given that workers from declining traded industries appear to be somewhat older, less educated, more likely to be married and to have longer tenure on the predisplacement job, it is not clear whether this observation is because of observable worker heterogeneity or because of industry–specific effects on individuals, such as the endowment of obsolete industry–specific human capital. The analysis of this section will shed some light on the actual source of the difference in unemployment duration and wages.

Table 2
Unemployment Duration
(Standard Errors in Parentheses)

Variable	Reg 1	Reg 2	Reg 3	Reg 4
TRDDEC	–	–0.015	–	–0.038
		(0.048)		(0.054)
TRDEXP	–	–0.107*	–	–0.132*
		(0.050)		(0.062)
TENURE	0.010***	0.010***	–	–
	(0.003)	(0.003)		
TRDDEC·Tenure	–	–	0.017***	0.019***
			(0.004)	(0.005)
TRDEXP·Tenure	–	–	0.006	0.010**
			(0.004)	(0.005)
NonTraded·Tenure	–	–	0.007*	0.005
			(0.003)	(0.004)
α	0.845	0.845	0.845	0.846
	(0.011)	(0.011)	(0.011)	(0.011)
–log L	12,673.7	12,671.3	12,671.0	12,668.2
N	8,462	8,462	8,462	8,462
N Censored	1,041	1,041	1,041	1,041

Levels of significance are based on a Chi-square statistic.
*Significant at the 90% level.
**Significant at the 95% level.
***Significant at the 99% level.

V.1 Unemployment Duration

Table 2 contains the coefficients on the trade variables from various specifications of the unemployment duration model of equation (1).[28] Regression 1, which excludes the trade variables, has been estimated in a number of other publications.[29] It is included in Table 2 to provide benchmark value for the TENURE variable and the log of the likelihood function. The coefficients are comparable to those found elsewhere, but in general are more precisely estimated because of the relatively large size of this dataset.

Column 2 presents the results from a specification including the two trade dummy

[28] A table containing the complete set of regression results is presented in Appendix C.
[29] See, for example, Kruse (1988), Podgursky and Swaim (1987a) and Solon (1985).

variables. Recall that TRDDEC is 1 for individuals displaced from a declining traded industry, an industry in a year in which trade competition is particularly severe. Conversely, TRDEXP is 1 for individuals displaced from an expanding traded industry. As expected, displacement from declining traded industries results in unemployment spells longer than those of workers displaced from expanding trading industries. They do not, however, experience spells significantly different from those of workers displaced from nontraded industries. The coefficients on TRDDEC and TRDEXP are significantly different from each other at the 90% level.

Recall that the ratio of β to α is the proportional change in the explanatory variable. From Regression 2 then, we find that displacement from a traded industry leads to a lower duration of joblessness than that experienced by workers from nontraded industries. Displacement from an expanding traded industry results in a spell of unemployment that is a significant 12.7% shorter, while the spell of unemployment for trade displaced workers is a statistically insignificant 1.8% shorter than that exhibited by workers displaced from nontraded industries. As the appropriate comparison group for the trade displaced workers is the set of workers displaced from other traded industries, we conclude that trade as the source of displacement increases the spell of joblessness by more than 10%.

Regression 3 allows for a more direct test of the human capital substitutability hypothesis. Here, the two trade variables and the tenure variable have been replaced by TENURE crossed with a dummy variable for each of the three types of industries. Using tenure on the predisplacement job as a proxy for the amount of firm/industry specific human capital the individual has developed, these three variables highlight the differences in human capital depletion among workers displaced from the three types of industries.

While the results from Regression 2 hinted at a different experience for those in declining and expanding trade industries, the results of Regression (3) paint a clearer picture. Here we find increased support for the link to comparative advantage discussed previously. Displacement from a declining traded industry will result in a 2.0% increase

in the duration of unemployment for each year of tenure, while the same number is only 0.7% for workers displacement from an expanding traded industry and 0.8% for a worker displaced from a nontraded industry. This suggests that the erosion of human capital associated with displacement is more significant for those displaced from declining traded industries than for other displaced workers.

Regression 3 imposes the restriction that TRDDEC and TRDEXP are independently unimportant; *i.e.*, that their coefficients are equal to zero. From Regression 4, which relaxes this restriction, we see that there are factors inherent in displacement from a traded industry, expanding or contracting, that result in a *shorter* spell of unemployment. This finding suggests that perhaps working in a traded goods industry provides a positive signal to the market. A possible explanation is that employment in a traded goods industry results in the accumulation of general skills that transfer more easily to the nontraded sector than vice versa.[30]

Some fraction of the difference in the coefficients on the trade dummies may be attributable to the receipt of trade adjustment assistance. That is, individuals displaced from declining traded industries may have received a more substantial compensation package than those displaced from expanding traded industries. Previous studies have suggested a positive link between the generosity of the compensation package and the duration of unemployment. Note that this is not necessarily bad; a longer spell of unemployment may imply that the worker is holding out for a position that provides a better match between employer and employee. Given the small and declining roll of the TAA, this is not believed to be a serious source of bias.

[30] The descriptive statistics of Table 1 suggest that workers displaced from traded industries are from industries that pay a large wage premium. The inclusion of the wage differential does not, however, significantly impact the coefficients on the traded industry variables. Each of the trade–related coefficients is smaller, but only marginally so. We can therefore rule out the argument that it is the wage premiums that are driving the duration of unemployment rather than the traded variables.

Table 3
Decomposition of Expected Unemployment Duration

	Declining Traded	Expanding Traded	Nontraded
# of Weeks Due to:			
Individual Characteristics	33.6	23.1	22.4
Type of Industry	3.8	-2.3	-
Total Expected Unemployment	37.4	20.8	22.4

Decomposition of Expected Unemployment Spells

Recall that previous studies attribute the difference in postdisplacement experience of trade displaced workers to individual–specific characteristics that are likely to affect the difficulty of obtaining subsequent employment. The coefficients from Regression 4 of Table 2 are used to separate the contribution of individual–specific characteristics from the contribution of the industry of displacement, expanding or declining traded, to the expected number of weeks of unemployment. Table 3 presents the results of these calculations. The first source, individual characteristics, is the number of weeks we would expect the individual to be unemployed in the absence of specific industry of displacement effects. The second source is the expected addition to the spell of unemployment by the category of the industry of displacement.

The total expected unemployment duration is the mean of the predicted values from Regression 4 of Table 2. The value expressed here is the expected number of weeks absent any censoring and is therefore significantly greater than the mean number of weeks expressed in Table 1. The expected duration for declining traded industries is approximately 10 weeks longer than the censored mean.[31] The number of weeks unemployed due to individual characteristics is calculated as the predicted values absent the effects of the traded industry dummy variables; that is, with TRDDEC, and TRDEXP set equal to

[31] It is plausible that the censoring mechanism reduces the mean so dramatically given that fully one fourth of the observations are censored.

zero and the effect of TENURE set equal to that for workers displaced from nontraded industries. The effect of the type of industry is then the difference between the values for total and individual–specific characteristics.

Row 1 of Table 3 confirms the results of previous studies. The demographic characteristics of workers displaced by trade *do* result in abnormally long spells of unemployment: ten weeks longer than for those displaced from expanding traded industries and eleven weeks longer than those from nontraded industries. Approximately 50% of this difference is, however, attributable to the year of displacement and the local unemployment rate. The pattern of trade displacements during the 1980s is one of substantial losses during the early years and roughly offsetting gains in the latter years. Given the recession of the early 1980s, the influence of the year of displacement and local unemployment rate is not surprising. In addition, throughout the 1980s the nontraded industries were expanding more rapidly than were the traded industries. It is, therefore, not entirely surprising that the characteristics of those displaced from expanding traded industries are not those in greatest demand; *i.e.*, that the individual–specific characteristics of those displaced from expanding traded industries resulted in a longer period of joblessness than that observed for workers displaced from nontraded industries.

In addition to the effects of individual–specific characteristics, however, being displaced from a declining traded industry is responsible for an additional 3.8 weeks of unemployment more than that experienced by those displaced from nontraded industries and 6.1 weeks longer than those displaced from expanding traded industries. The particular type of industry–specific human capital possessed by the workers is therefore responsible for an additional month of joblessness, or a 10% to 20% increase in the duration of joblessness for those displaced by trade in the 1980s.

The decomposition of unemployment spells can be utilized to provide information into the effects on aggregate unemployment in the United States due to changing trade patterns. Note that there are two ways changes in international competition can alter

Table 4
Changes in the Number of Weeks of Unemployment Caused by International Trade in the 1980s
(in thousands of weeks)

	Declining Traded	Expanding Traded	Net Change
# of weeks due to:			
Trade Related Displacements:			
Individual Characteristics	6,129	-4,272	1,858
Type of Industry	693	-425	268
Non-Trade Related Displacements:			
Type of Industry	27,613	-15,180	12,432
Total	34,435	-19,876	14,558
Number of Trade Related Displacements	182,417	-185,408	-2,991

aggregate joblessness. The first, and most obvious mechanism, is through increased displacements. The second, and more subtle mechanism, is by altering the erosion of human capital of non-trade related displacements. That is, the change in international competitiveness of an industry not only alters the volume of displacements from the industry, but it alters the reemployment possibilities of those workers that would have been displaced even in the absence of changes in international competition.

Table 4 presents an accounting of the aggregate number of weeks of unemployment directly attributable to changes in the competitive position of the United States. The first column presents the increase in the number of weeks of unemployment due to increased increased international competition in some industries, while the second column presents the reduction due to the increased competitive position of expanding traded industries. The values are generated by predicting, again from Regression 4 of Table 2, the expected duration of unemployment for all of the displaced workers in each industry in each year, 1981 through 1989. The average of these values is then multiplied by the change in the

number of displacements resulting from trade in that industry and year. If the industry experienced a greater number of displacements this value is accumulated in the Declining Traded column. Similarly, reductions are accumulated in the Expanding Traded column. The net effect of changing trade patterns is then presented in Column 3.

The impact on aggregate joblessness is further decomposed into the effects of trade related displacements and non–trade related displacements. Trade related displacements influence aggregate joblessness both through individual characteristics and through the type of industry or human capital effects. Non–trade related displacements, displacements from traded industries that would have occurred regardless of changing trade competition, are included because changes in trade patterns will influence their ability to find work; *i.e.*, through changes in the markets valuation of their industry–specific human capital.

As is evident from the table, the reduction of displacements due to increased competitiveness in some industries fails to offset the increase in the number of weeks of unemployment attributable to the decline of other traded industries. Although the net impact of trade was to *reduce* the *number* of displacements by 2,991, the overall impact on the expected length of joblessness resulted in a net *increase* in the number of weeks of unemployed resources of more than 14.5 million weeks, almost 390 thousand person–years. The bulk of this, 12.4 out of 14.5 weeks, is due to the increased erosion of the human capital of workers that would have suffered displacement regardless of changes in international competition.

While the results of this section include the primary influences of trade on aggregate unemployment, it should be pointed out that the results of Table 4 omit the effects of two possibly important aspects of aggregate unemployment. The results omit any changes in unemployment due to unemployment congestion. If many of the trade displaced workers are in the same area as workers displaced from nontraded industries, this will increase the spell of joblessness for nontraded workers. Further, the results omit the effects of trade on job search by new entrants into the workforce and voluntary industry switchers. Nev-

Table 5
Postdisplacement Wage Equations
(Standard Errors in Parentheses)

Variable	Dependent Variable $\ln W_{i,t}$ (1)	$\ln W_{i,t}$ (2)	$\ln W_{i,t} - \ln W_{i,t-1}$ (3)
TRDDEC	0.039*** (0.005)	0.005 (0.013)	−0.046*** (0.005)
TRDEXP	−0.021 (0.014)	0.005 (0.004)	0.043*** (0.015)
Tenure	−0.004 (0.017)	−0.004 (0.013)	−0.004 (0.018)
$\ln W_{i,t-1}$	–	0.405*** (0.015)	–
Ln($\widehat{\text{Unemp}}$)	−0.030** (0.015)	−0.038*** (0.012)	−0.049*** (0.016)
λ	−0.948*** (0.078)	−0.287*** (0.057)	0.676*** (0.070)
R^2	.419	.512	.129
N	5,741	5,741	5,741

$\widehat{\text{Unemp}}$ is the predicted weeks of unemployment(+1) from Regression 4 in Table 4.
λ is the Inverse Mills Ratio.
**Significant at the 95% level.
***Significant at the 99% level.

ertheless, the impact presented here suggests a significant influence of trade on aggregate joblessness.

V.2 Postdisplacement Wages

Table 5 contains the results from the post–displacement wage regression analysis.[32] The sign and magnitude of the coefficients reported are consistent with the results from previous studies. The coefficient on unemployment duration is negative and significant

[32] Recall the two statistical corrections: first, the Heckman two–step correction for selection bias, and second, as a correction for the endogeneity of unemployment duration, the predicted values from Regression 4 of Table 2 in the previous section is included as a regressor.

for all specifications. As in Addison and Portugal (1988), there appears to be a negative selection bias; *i.e.*, holding unemployment duration constant, the employed individuals are earning less than would be expected from their unemployed counterparts. In Regression 3, however, the currently employed experienced a greater wage recovery than we would expect to observe for those remaining unemployed.

Regression (1) suggests that, when you do not control for predisplacement wages, individuals displaced from declining traded industries have higher postdisplacement earnings than do all others. At first blush, this would appear to contradict the simple statistics of Table 1, where the postdisplacement wages for trade displaced workers were reported as lower than for other workers. This is, however, consistent with the evidence from the unemployment duration analysis. There, it was found that the market seems to value past employment in a traded industry, regardless of changes in competitiveness. Therefore, workers from declining traded industries may well receive higher post displacement wages than workers with similar characteristics from other industries.

Regression (2), a specification including the predisplacement wage as a regressor, suggests that workers displaced from traded industries, whether declining or expanding, have higher current wages than other displaced workers. These coefficients are, however, both economically and statistically insignificant.

The final set of results, Regression (3), provides an indication of the extent to which the displaced individual has recovered their predisplacement wages. Controlling for individual heterogeneity, both observed and unobserved, the evidence suggests that after at least two years have passed, the wages of trade displaced workers are significantly less likely to have recovered than are the wages of others. In addition, the wages of those displaced from expanding traded industries have more fully recovered than have those of other displaced workers. Overall, the results indicate that workers displaced by trade have recovered between 4.6 and 8.9 percent less of their prediplacement wage than have other displaced workers.

The results of this section are consistent with the findings regarding the duration of unemployment: workers displaced from declining traded industries incur greater postdisplacement loss than do workers displaced from other industries. An interesting sidenote, however, is the result that, while wage recovery is less complete for trade displaced workers, their postdisplacement wages are, *ceteris paribus* higher than the wages of other displaced workers. This result is somewhat surprising and suggests that although trade displaced workers incur a more significant loss, they are still doing well relative to their peers.

VI. Conclusion and Policy Implications

In the introduction, we asked the questions: did the industrial/intertemporal shift of displacements from expanding to declining traded industries result in significantly longer observed spells of unemployment? Did it result in larger changes in observed wages? To both of these questions, the answer appears to be a resounding yes. Displacement from a declining traded industries leads to unemployment spells approximately 6.1 weeks longer than would be expected. In addition, by relating the postdisplacement experience of individuals to changes in the competitive position of the industry from which the individual was displaced, we found that not only did changing trade patterns result in longer spells of unemployment for a large number of displaced workers, but it increased the aggregate number of weeks individuals were unemployed by more than 14 million, almost 390 thousand person–years. Further, it was found that, at least two years after displacement, the trade displaced workers had recovered between 4.6 and 8.9 percent less of their predisplacement wage than had other displaced workers.

While these results provide evidence that workers in declining traded industries experience greater hardship when displaced than do workers from other industries, it has been suggested elsewhere that this was merely a result of the characteristics of the displaced workers; *i.e.*, trade displaced workers are more likely to be female, black, and less skilled, and that these workers have a particularly difficult postdisplacement experience regardless

of the industry from which they were displaced.[33] If this assertion is correct, then the argument for specific relief of trade displaced workers, *e.g.*, TAA, is diminished. This assertion is, however, inconsistent with the results presented above. Both the results for unemployment duration and changes in wages suggest that trade displaced workers suffer to a greater degree because they are trade displaced. The explanation that trade displaced workers are endowed with a large proportion of particularly useless industry–specific human capital is reflected clearly in the results.

The implication is therefore that if assistance to displaced workers is to be most productive, *i.e.*, directed towards those most in need, targeting trade displaced workers would seem to be appropriate. Indeed, the results suggest beneficial effects of trade–related assistance based on both distributional equity and allocative efficiency grounds. The evidence presented reveals a loss of income to those displaced because of trade which exceeds the income gains to those remaining employed because of an increased competitive position of their industry. Combined with the benefits to consumers of freer trade, distributional considerations suggest some assistance in the form of income maintenance is warranted.

The results presented in Section 5.1 suggest an argument based on allocative efficiency for assistance. The findings presented reveal that even when the increased employment in expanding traded industries is considered, there is a considerable increase in the quantity of unemployed resources resulting from the adjustment to changes in international competitiveness. It would seem that job retraining or job search assistance would also be a reasonable response to combat the allocative efficiency effects, *i.e.*, an increased unemployment of resources, resulting from changes in international competition.

[33] See Tyson *et al.* (1988), pg. 80.

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APPENDIX A

DECOMPOSITION OF THE CHANGE IN DISPLACEMENTS BY INDUSTRY AND YEAR

Table A.1

Breakdown of Displacements by Industry for 1981 through 1989

		Displacements			
			Change due to:*		
#	Industry	Actual	X+M	X	M
2	Mining (Excl Petroleum)	139987	7895	1016	6879
3	Meat Products	89867	11827	402	11425
4	Canned and Preserved Fruits and Vegetables	64826	1028	77	952
5	Dairy and Grain Products	63438	-116	691	-808
6	Beverage and Misc Food Products	48755	-837	-118	-718
7	Stone, Clay, Glass and Concrete Products	151622	1015	-1060	2075
8	Furniture and Fixtures	158012	-1170	-78	-1093
9	Leather and Leather Products	101422	-1284	-581	-703
10	Household Appliances	52231	4	-105	109
11	Radio, TV and Comm Equipment	120110	5249	212	5037
12	Motor Vehicles and Motor Vehicle Products	352222	-10509	701	-11210
13	Misc. Plastic Products	53733	-875	281	-1156
14	Sawmills, Planing Mills & Millwork	109550	9047	34	9013
15	Lumber & Wood Products (Excl Furniture and 14)	95932	-386	-209	-177
16	Apparel	363905	-9212	-2364	-6848
17	Paper and Allied Products	89295	1792	-762	2554
18	Chemicals and Allied Products	150113	94	105	-11
19	Petroleum and Rubber Products	45440	-7051	-549	-6502
20	Primary Metal Industries	282613	29687	-1189	30877
21	Fabricated Metal Products	261595	-5359	-1257	-4102
22	Engines, Turbines and Farm Machinery and Equipment	426770	-3580	-3042	-538
23	Construction and Material Handling Machines	165095	-517	-647	130
24	Office Machines	123727	1845	869	976
25	Textile Mill Products	149899	-8681	-486	-8195
26	Electrical Machinery nec	324679	-2322	-385	-1937
27	Transportation Equipment	187329	-13904	3777	-17682
28	Professional and Photographic Equipment	149788	-1269	-664	-605
29	Aircraft and Parts	127834	-4322	-1167	-3155
30	Metalworking Machinery	79427	-1079	-76	-1003
	Total	4529214	-2991	-6578	3587

Source: Haveman (1992).

* X = Changes in the export price, M = changes in the import price and X+M is the combined effect.

Table A.2

Breakdown of Displacements by Year 1981 through 1989

	Displacements			
		Change due to:		
Year	Actual	X+M	Export Price	Import Price
1981	378933	62572	-1531	64102
1982	574594	30770	-377	31147
1983	689962	11014	28	10986
1984	540342	4987	-1071	6058
1985	712690	5505	-1581	7086
Sub-Total	2896521	114848	-4532	119379
1986	447284	-60573	-846	-59727
1987	430524	-51955	988	-52437
1988	335283	-16449	-1050	-15399
1989	419601	11140	-1138	12278
Sub-Total	1632692	-117837	-2046	-115285
Total	4529213	-2991	-6578	3587

Source: Haveman (1992).

APPENDIX B

DESCRIPTION OF VARIABLES

Table B.1

Description of Variables

Variable	Mean*	Description
Age	37.33	Age at the time of the survey.
Dage	33.55	Age at the time of displacement.
Age > 50	0.08	Dummy: 1 if the individual is over 50 years old.
Dage > 50	0.08	Dummy: 1 if the individual was over 50 years old at the time of displacement.
Age1	37.33	Age spline, age between 20 and 35.
Age2	22.75	Age spline, age between 36 and 50.
Age3	0.67	Age spline, age between 51 and 65.
Dage1	33.55	Displacement age spline, age between 20 and 35.
Dage2	16.66	Displacement age spline, age between 36 and 50.
Dage3	0.26	Displacement age spline, age between 51 and 65.
Married	0.69	Dummy: 1 if the individual is married.
Head	0.70	Dummy: 1 if displaced individual is the head of household.
Black	0.11	Dummy: 1 if the individual is black.
Female	0.33	Dummy: 1 if the individual is female.
Educ < 9	0.04	Dummy: 1 if fewer than 9 years of education.
9 ≤ Educ < 12	0.10	Dummy: 1 if some high school education.
12 < Educ < 16	0.25	Dummy: 1 if some college education.
16 ≤ Educ	0.19	Dummy: 1 if more than 16 years of education.
Tenure	4.92	Number of years employed at predisplacement job.
TenureSQ	61.24	TENURE squared.
Part Time	0.11	Dummy: 1 if currently employed part time.
$LnW_{i,t}$	5.76	Log of weekly postdisplacement wage.
$LnW_{i,t-1}$	5.84	Log of Weekly predisplacement wage.
Wage Differential	0.04	Wage premium paid in industry of displacement.
Shutdown	0.55	Dummy: 1 if plant closed or shutdown.
Slack	0.30	Dummy: 1 if displaced because of slack work.
Abolish	0.14	Dummy: 1 if displaced because position abolished.
Expect	0.53	Dummy: 1 if displacement was anticipated.
Rec Unemp	0.58	Dummy: 1 received unemployment insurance.
TRDDEC	0.21	Dummy: 1 if displaced from declining traded industry.
TRDEXP	0.15	Dummy: 1 if displaced from expanding traded industry.
Ind Growth	1.01	Growth rate of the broad industry category, manufacturing or services.
Urban	0.71	Dummy: 1 living within an SMSA.
South	0.30	Dummy: 1 if displaced in the south.

*Mean of the variables under the sample restrictions for the unemployment duration analysis. The sample restrictions for the wage regressions produces simple statistics that are not qualitatively different.

Table B. 1 — Description of Variables
(con't)

Variable	Mean*	Description
State Unemp	7.18	State unemployment rate in the year of displacement.
— Trend	-0.26	Change in the state unemployment rate in the year following displacement.
Move	0.25	Dummy: 1 if moved to find employment.
New Ind	0.74	Dummy: 1 if switched industry.
New Occ	0.79	Dummy: 1 if switched occupation.
$Ln(\widehat{Unemp})$	2.31	Predicted unemployment; from Regression 4 in Table 4.
λ		Inverse Mills Ratio from reemployment probit regression.
Pre4	0.30	Dummy: 1 displaced 4 years prior to survey.
Pre5	0.24	Dummy: 1 displaced 5 years prior to survey.
1981,...,1988		Dummy variables for year of displacement.
(D) Occ1		Executive, Administrative, and Managerial Occupations.
(D) Occ2		Professional Specialty Occupations.
(D) Occ3		Technicians and Related Support Occupations.
(D) Occ4		Sales Occupations.
(D) Occ5		Administrative Support Occupations, Including Clerical.
(D) Occ6		Private Household Service Occupations.
(D) Occ7		Protective Service Occupations.
(D) Occ8		Service Occupations, Except Protective and Household.
(D) Occ9		Farming, Forestry, and Fishing Occupations.
(D) Occ10		Precision Production, Craft, and Repair Occupations.
(D) Occ11		Machine Operators, Assemblers, and Inspectors.
(D) Occ12		Transportation and Material Moving Equipment Occupations.
(D) Occ13		Handlers, Equipment Cleaners, Helpers and Laborers.

*Mean of the variables under the sample restrictions for the unemployment duration analysis. The sample restrictions for the wage regressions produces simple statistics that are not qualitatively different.

APPENDIX C

COMPLETE RESULTS FROM THE REGRESSION ANALYSIS

Table C.1

Unemployment Duration

(Standard Errors in Parentheses)

Variable	Reg 1	Reg 2	Reg 3	Reg 4
Intercept	2.826 (0.868)	3.315 (0.982)	2.485 (0.902)	3.305 (0.982)
Educ $<$ 9	0.292 (0.083)	0.290 (0.083)	0.292 (0.083)	0.291 (0.083)
$9 \leq$ Educ $<$ 12	0.246 (0.054)	0.245 (0.054)	0.244 (0.054)	0.247 (0.054)
12 $<$ Educ $<$ 16	-0.101 (0.037)	-0.106 (0.037)	-0.103 (0.037)	-0.107 (0.037)
16 $\leq$ Educ	-0.111 (0.045)	-0.111 (0.045)	-0.113 (0.045)	-0.114 (0.045)
Recunemp	0.943 (0.031)	0.947 (0.031)	0.943 (0.031)	0.950 (0.031)
Part Time	0.354 (0.047)	0.354 (0.047)	0.356 (0.047)	0.354 (0.047)
Female	0.052 (0.040)	0.052 (0.040)	0.052 (0.040)	0.052 (0.040)
Black	0.334 (0.037)	0.339 (0.037)	0.337 (0.037)	0.340 (0.037)
Dispage 1	0.017 (0.004)	0.017 (0.004)	0.017 (0.004)	0.017 (0.004)
Dispage 2	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Dispage 3	-0.000 (0.012)	-0.000 (0.012)	0.001 (0.012)	0.000 (0.012)
Married	-0.094 (0.032)	-0.093 (0.032)	-0.095 (0.032)	-0.093 (0.032)
State Unemp	0.100 (0.008)	0.099 (0.008)	0.099 (0.008)	0.098 (0.008)
— Trend	0.045 (0.019)	0.043 (0.019)	0.044 (0.019)	0.040 (0.019)
Head	-0.262 (0.038)	-0.262 (0.038)	-0.263 (0.038)	-0.266 (0.038)
Shut Down	-0.207 (0.044)	-0.204 (0.044)	-0.209 (0.044)	-0.209 (0.044)
Slack	-0.043 (0.048)	-0.042 (0.048)	-0.043 (0.048)	-0.042 (0.048)
Expect	-0.113 (0.029)	-0.111 (0.029)	-0.112 (0.029)	-0.112 (0.029)
Docc1	-0.035 (0.066)	-0.038 (0.066)	-0.033 (0.066)	-0.034 (0.066)
Docc2	-0.044 (0.063)	-0.039 (0.063)	-0.043 (0.063)	-0.040 (0.063)
Docc3	-0.105 (0.086)	-0.102 (0.086)	-0.108 (0.086)	-0.104 (0.086)
Docc4	-0.151 (0.061)	-0.153 (0.061)	-0.151 (0.061)	-0.151 (0.061)
Docc5	-0.114 (0.060)	-0.115 (0.060)	-0.115 (0.060)	-0.115 (0.060)
Docc6	-0.416 (0.686)	-0.420 (0.686)	-0.415 (0.686)	-0.393 (0.686)
Docc7	0.131 (0.203)	0.130 (0.203)	0.142 (0.203)	0.149 (0.203)
Docc8	-0.076 (0.079)	-0.079 (0.079)	-0.077 (0.079)	-0.080 (0.078)
Docc9	0.136 (0.137)	0.132 (0.138)	0.147 (0.138)	0.143 (0.138)
Docc10	-0.188 (0.054)	-0.189 (0.054)	-0.187 (0.054)	-0.191 (0.054)
Docc11	0.039 (0.061)	0.061 (0.062)	0.032 (0.061)	0.063 (0.062)
Docc12	-0.016 (0.080)	-0.019 (0.080)	-0.013 (0.080)	-0.018 (0.080)
1981	0.271 (0.081)	0.252 (0.082)	0.283 (0.082)	0.260 (0.082)
1982	0.083 (0.078)	0.078 (0.078)	0.083 (0.078)	0.081 (0.078)
1983	0.073 (0.089)	0.097 (0.092)	0.052 (0.090)	0.090 (0.092)
1984	-0.034 (0.077)	-0.017 (0.078)	-0.038 (0.077)	-0.015 (0.078)
1985	-0.128 (0.064)	-0.117 (0.065)	-0.130 (0.065)	-0.120 (0.065)
1986	-0.159 (0.072)	-0.131 (0.074)	-0.148 (0.073)	-0.128 (0.074)
1987	-0.050 (0.067)	-0.015 (0.068)	-0.039 (0.067)	-0.014 (0.068)
1988	0.082 (0.073)	0.108 (0.074)	0.090 (0.073)	0.108 (0.074)
Ind. Growth	-1.096 (0.838)	-1.566 (0.947)	-0.764 (0.873)	-1.540 (0.947)
Wage Differential	0.458 (0.100)	0.487 (0.103)	0.445 (0.101)	0.490 (0.103)
$\ln W_{t-1}$	-0.088 (0.033)	-0.091 (0.033)	-0.086 (0.033)	-0.088 (0.033)
Tenure	0.010 (0.003)	0.010 (0.003)	–	–
TRDDEC	–	-0.015 (0.048)	–	-0.038 (0.054)
TRDEXP	–	-0.107 (0.050)	–	-0.132 (0.062)
TRDDEC·Tenure	–	–	0.017 (0.004)	0.019 (0.005)
TRDEXP·Tenure	–	–	0.006 (0.004)	0.010 (0.005)
NonTraded·Tenure	–	–	0.007 (0.004)	0.005 (0.004)
α	0.845 (0.011)	0.845 (0.011)	0.845 (0.011)	0.846 (0.011)
-log L	12,673.7	12,671.3	12,671.0	12,668.2
N	8,462			

Table C.2

Reemployment Probit Regression

Depvar: Dummy variable = 1 if reemployed full time		
Variable	Coefficient	Std. Error
Intercept	-0.264	(0.256)
Educ < 9	-0.152	(0.086)
9 ≤ Educ < 12	-0.159***	(0.057)
12 < Educ < 16	0.071	(0.044)
16 ≤ Educ	0.304***	(0.057)
Age1	-0.007	(0.005)
Age2	0.000	(0.002)
Age3	-0.028***	(0.009)
Tenure	0.033***	(0.008)
TenureSQ	-0.001***	(0.000)
Married	0.147***	(0.038)
Black	-0.129**	(0.053)
Docc1	0.001	(0.078)
Docc2	-0.067	(0.074)
Docc3	0.163	(0.108)
Docc4	-0.077	(0.070)
Docc5	0.108	(0.069)
Docc7	-0.042	(0.216)
Docc8	-0.196**	(0.087)
Docc9	-0.188	(0.149)
Docc10	0.000	(0.062)
Docc11	0.048	(0.066)
Docc12	-0.062	(0.090)
Urban	0.105***	(0.038)
Shut Down	0.012	(0.040)
Abolish	0.037	(0.058)
Expect	0.050	(0.035)
$\ln W_{t-1}$	0.237***	(0.038)
Pre4	0.164***	(0.041)
Pre5	0.168***	(0.044)
State Unemp	-0.078***	(0.007)
— Trend	-0.089***	(0.012)
Rec Unemp	0.011	(0.037)
-log-L	-3,464	
N	7,227	

**Significant at the 95% level.
***Significant at the 99% level.

Table C.3

Postdisplacement Wage Equations

(Standard Errors in Parentheses)

Variable	Dependent Variable $\ln W_{i,t}$ (1)	$\ln W_{i,t}$ (2)	$\ln W_{i,t} - \ln W_{i,t-1}$ (3)
Intercept	6.067 (0.089)	3.662 (0.098)	0.107 (0.068)
Educ $<$ 9	-0.103 (0.045)	-0.076 (0.030)	-0.038 (0.041)
$9 \leq$ Educ $<$ 12	-0.054 (0.030)	-0.061 (0.020)	-0.073 (0.027)
$12 <$ Educ $<$ 16	0.040 (0.021)	0.033 (0.014)	0.022 (0.019)
$16 \leq$ Educ	0.130 (0.028)	0.118 (0.018)	0.102 (0.025)
Dispage1	0.005 (0.002)	-0.000 (0.002)	-0.008 (0.004)
Dispage2	-0.000 (0.001)	0.000 (0.001)	0.001 (0.000)
Dispage3	-0.002 (0.005)	-0.005 (0.003)	-0.010 (0.017)
TenureSQ	0.000 (0.004)	0.000 (0.003)	-0.000 (0.024)
Black	-0.017 (0.000)	-0.016 (0.000)	-0.014 (0.017)
Occ1	0.316 (0.019)	0.218 (0.012)	0.075 (0.002)
Occ2	0.272 (0.027)	0.202 (0.018)	0.095 (0.001)
Occ3	0.200 (0.020)	0.168 (0.013)	0.119 (0.006)
Occ4	0.090 (0.030)	0.031 (0.013)	-0.058 (0.033)
Occ5	0.080 (0.034)	0.048 (0.028)	0.000 (0.036)
Occ6	-0.489 (0.040)	-0.452 (0.030)	-0.406 (0.042)
Occ7	0.011 (0.029)	-0.026 (0.035)	-0.082 (0.033)
Occ8	-0.180 (0.028)	-0.163 (0.028)	-0.139 (0.031)
Occ9	-0.171 (0.082)	-0.183 (0.027)	-0.201 (0.121)
Occ10	0.157 (0.043)	0.107 (0.114)	0.031 (0.049)
Occ11	-0.010 (0.028)	-0.005 (0.043)	0.001 (0.032)
Occ12	0.102 (0.051)	0.048 (0.028)	-0.032 (0.059)
Female	-0.197 (0.025)	-0.086 (0.051)	0.078 (0.029)
Married	0.011 (0.027)	0.024 (0.025)	0.044 (0.031)
Head	0.083 (0.030)	0.062 (0.027)	0.032 (0.034)
Urban	0.086 (0.015)	0.089 (0.029)	0.093 (0.016)
South	-0.091 (0.013)	-0.074 (0.014)	-0.049 (0.015)
Move	0.002 (0.011)	-0.016 (0.013)	-0.043 (0.013)
New Ind	-0.134 (0.013)	-0.103 (0.011)	-0.059 (0.014)
New Occ	-0.111 (0.014)	-0.092 (0.011)	-0.064 (0.014)
Ln($\widehat{Unemp}$)	-0.030 (0.015)	-0.038 (0.012)	-0.049 (0.016)
TRDDEC	0.039 (0.005)	0.005 (0.013)	-0.046 (0.005)
TRDEXP	-0.021 (0.014)	0.005 (0.004)	0.043 (0.015)
Tenure	-0.004 (0.017)	-0.004 (0.013)	-0.004 (0.018)
$\ln W_{t-1}$	–	0.405 (0.015)	–
λ	-0.948 (0.078)	-0.287 (0.057)	0.676 (0.070)
R^2	0.419	0.512	0.129
N	5,742		

$\widehat{Unemp}$ is predicted weeks of unemployment(+1) from Regression 4 in Table 4.
λ is the Inverse Mills Ratio.